

AMENDMENTS TO THE CLAIMS

The listing of claims below replaces all prior versions of claims in the application.

1. (Currently Amended) A RAID apparatus for separating data according to a RAID configuration definition and reading/writing the data from/to a plurality of physical disk devices in parallel, comprising:

a control unit for accessing said plurality of physical disk devices according to RLU (RAID logical unit) mapping based on said RAID configuration definition upon an I/O request from a host device;

a table for storing old RAID configuration definition information which defines at least an old RAID level and a number of old logical devices, and new RAID configuration definition information which defines at least a new RAID level and a number of new logical devices; and

a cache memory for temporarily storing data for changing the old RAID configuration to the new RAID configuration,

wherein said control unit reads out the data from said plurality of physical disk devices to said cache memory according to the RLU RAID logical unit mapping based on said old RAID configuration definition of said table, and writes the data which was read out to said cache memory to said plurality of physical disk devices according to the RLU RAID logical unit mapping based on said new RAID configuration definition of said table in an active status.

2. (Original) The RAID apparatus according to Claim 1, wherein said control unit performs RAID level conversion processing by reading out the data from said plurality of physical disk devices to said cache memory according to the RLU mapping based on the RAID level of said old RAID configuration definition, and writing the data which was read out to said cache memory to said plurality of physical disk devices according to the RLU mapping based on the RAID level of said new RAID configuration definition.

3. (Original) The RAID apparatus according to Claim 1, wherein said control unit performs capacity increase processing by reading out the data from said plurality of physical disk devices to said cache memory according to the RLU mapping based on said number of logical devices in said old RAID configuration definition, and writing the data which was read out to said cache memory to said plurality of physical disk devices according to the RLU mapping based on said number of logical devices in said new RAID configuration definition.

4. (Original) The RAID apparatus according to Claim 1, wherein said control unit executes conversion from said old RAID configuration to said new RAID configuration sequentially and manages the progress status thereof, as well as judges whether an I/O request sent from said host device is for a converted area during said conversion, executes said I/O request using said new RAID configuration definition when the I/O request is for a converted area, and executes said I/O request using said old RAID configuration definition when the I/O request is for an unconverted area.

5. (Currently Amended) The RAID apparatus according to Claim 1, wherein said control unit converts RLBA (RAID logical block address) based on the new RAID configuration definition to the host LBA (logical block address), then reads out the data from said plurality of physical disk devices to said cache memory according to the RLU RAID logical unit mapping based on said old RAID configuration definition using said host LBA logical block address, and writes the data which was read out to said cache memory to said plurality of physical disk devices according to the RLU RAID logical unit mapping based on said new RAID configuration definition using said RLBA RAID logical block address.

6. (Original) The RAID apparatus according to Claim 1, wherein said control unit converts said old RAID configuration into said new RAID configuration, and then deletes said old RAID configuration definition from said table.

7. (Original) The RAID apparatus according to Claim 1, wherein said control unit creates said new RAID configuration definition in said table according to the instructed parameters of the new RAID configuration definition and said old RAID configuration definition.

8. (Currently Amended) The RAID apparatus according to Claim 1, wherein said control unit acquires an area of said cache memory corresponding to the a conversion area, and then executes conversion from said old RAID configuration into said new RAID configuration sequentially.

9. (Original) The RAID apparatus according to Claim 8, wherein said control unit separates said conversion processing into sections and executes the processing a plurality of times when the area of said cache memory corresponding to said conversion area cannot be acquired.

10. (Original) The RAID apparatus according to Claim 1, wherein said control unit performs said RLU mapping according to a strip depth and stripe size corresponding to the stripe of said RAID configuration.

11. (Currently Amended) A logical device expansion method for a RAID apparatus which separates data according to a RAID configuration definition and reads/writes the data to a plurality of physical disk devices in parallel, comprising the steps of:

reading out the data from said plurality of physical disk devices to a cache memory according to an RLU (RAID logical unit) mapping based on an old RAID configuration definition information which defines at least an old RAID level and a number of old logical devices; and

writing the data which was read out to said cache memory to said plurality of physical disk devices according to an RLU RAID logical unit mapping based on a new RAID configuration definition information which defines at least a new RAID level and a number of new logical devices,

wherein said reading and writing are executed in an active status.

12. (Original) The logical device expansion method according to Claim 11, wherein said reading step comprises a step of reading out the data from said plurality of physical disk devices to said cache memory according to an RLU mapping based on the RAID level of said old RAID configuration definition, and

 said writing step comprises a step of writing the data which was read out to said cache memory to said plurality of physical disk devices according to an RLU mapping based on the RAID level of said new RAID configuration definition.

13. (Original) The logical device expansion method according to Claim 11, wherein said reading step comprises a step of reading the data from said plurality of physical disk devices to said cache memory according to an RLU mapping based on said number of logical devices of said old RAID configuration definition, and

 said writing step comprises a capacity increase step of writing the data which was read out to said cache memory to said plurality of physical disk devices according to an RLU mapping based on said number of logical devices of said new RAID configuration definition.

14. (Original) The logical device expansion method according to Claim 11, further comprising the steps of:

 managing the progress status of executing conversion from said old RAID configuration into said new RAID configuration sequentially;

judging whether an I/O request sent from a host device is for a converted area during said conversion;

executing said I/O request using said new RAID configuration definition when the I/O request is for a converted area; and

executing said I/O request using said old RAID configuration definition when the I/O request is for an unconverted area.

15. (Currently Amended) The logical device expansion method according to Claim 11, wherein said reading step comprises a step of converting RLBA (RAID logical block address) based on the new RAID configuration definition to a host LBA (logical block address), and then reading out the data from said plurality of physical disk devices to said cache memory according to an RLU (RAID logical unit) mapping based on said old RAID configuration definition using said host LBA logical block address, and

said writing step comprises a step of writing the data which was read out to said cache memory to said plurality of physical disk devices according to an RLU RAID logical unit mapping based on said new RAID configuration definition using said RLBA RAID logical block address.

16. (Original) The logical device expansion method according to Claim 11, further comprising a step of deleting said old RAID configuration definition after said conversion of said old RAID configuration into said new RAID configuration.

17. (Original) The logical device expansion method according to Claim 11, further comprising a step of creating said new RAID configuration definition in the table according to the instructed parameters of the new RAID configuration definition and said old RAID configuration definition.

18. (Currently Amended) The logical device expansion method according to Claim 11, further comprising a step of acquiring an area of said cache memory corresponding to the ~~a~~ conversion area, and then executing conversion from said old RAID configuration into said new RAID configuration sequentially.

19. (Original) The logical device expansion method according to Claim 18, further comprising a step of separating said conversion processing into sections and executing the processing a plurality of times when the area of said cache memory corresponding to said conversion area cannot be acquired.

20. (Original) The logical device expansion method according to Claim 11, further comprising a step of performing said RLU mapping according to a strip depth and stripe size corresponding to the stripe of said RAID configuration.